JOURNAL
OF THE
WASHINGTON ACADEMY OF SCIENCES

VOL. 13 JANUARY 4, 1923 NO. 1

PETROLOGY.—*The genesis of melilite.*[1] N. L. BOWEN, Geophysical Laboratory, Carnegie Institution of Washington.

In a recent paper the writer described some alnoitic rocks from Isle Cadieux, Quebec, that contain the mineral, monticellite. This was presumed to be the first recognition of monticellite as an igneous-rock mineral.[2] After the paper was published K. H. Scheumann called my attention to a mineral occurring in rocks of a related character from Polzen, Bohemia, of which mineral he has said: "Perhaps we are dealing with monticellite, whose occurrence in a rock so rich in magnesia would not be surprising, or perhaps with an olivine rich in the monticellite molecule." Scheumann's descriptions show that the mineral is, with little possible doubt, the same as that in the Canadian rocks and is to be regarded as monticellite even though his optical determinations were not sufficiently quantitative to establish its identity.[3] These observations of Scheumann's were not known to me nor were they recalled by any of the petrologists with whom I discussed the occurrence of monticellite in igneous rocks. Had the Polzen rocks been described under more familiar names such as alnoite, melilite basalt, with such qualifying terms as may have been necessary, they and their characters would not have escaped my notice in general abstract literature, but appearing under the disguise of locality names it is perhaps not surprising that they did not attract attention. Of this matter more later.

In the paper on the Cadieux rocks were included the results of some experimental work designed to throw light on the origin of some of the mineral phases present. Experiment showed that, in certain

[1] Received December 7, 1922.
[2] N. L. Bowen, Am. J. Sci. III: 1–34. 1922.
[3] K. H. Scheumann. Königl. säschs Gesell. d. Wiss. Abhandl. 32: 7, 732–4. 1913.

mixtures of diopside and nephelite, diopside may separate early and then, by reaction with the liquid, be replaced by forsterite (olivine) and akermanite (melilite). This was in accord with the mineral paragenesis in the Cadieux rocks, and it was suggested that an alkaline (nephelite-rich) liquid reacted with augite to produce monticellite and melilite, acting, as it were, as a desilicating agent. It was suggested also that an analcite-rich liquid was produced by the reaction and that this gave rise to the analcite dikes.

Scheumann in a more recent paper discusses the application of these conclusions to the rocks of the Polzen region and decides that, while these reactions were in part responsible for the production of lime-rich minerals, especially melilite, yet addition of lime to the magma must be considered an important factor particularly in the production of monticellite. He suggests, too, that since melilite separates "in excess" it may later react with the liquid to reproduce pyroxene and of this reaction he finds evidence in the Polzen rocks.[4] In the artificial mixtures, no doubt, this reversal of the reaction with reformation of pyroxene and nephelite would occur at lower temperatures, but this fact cannot be demonstrated on account of the sluggishness of reaction. The reversal did not occur in the Cadieux rocks for the reason, as believed, that the reacting liquid was separated (squeezed out) and formed the analcite dikes. Even if it had not been separated, analcite might have persisted as a ground-mass mineral in the presence of melilite just as quartz may occur in the ground-mass of an olivine-bearing rock. The requisite condition is very rapid cooling. Though Scheumann accepts the formation of some melilite by the reaction method demonstrated experimentally, he nevertheless appears to be offering an objection to it when he says "Melilite rocks in which the more silicic alkaline residue has crystallized as analcite are unknown." With this very question in mind I have myself been examining a few melilite rocks, sections of which were readily obtainable. In two of these I have found analcite as typical interstitial, residual material. The one is the melilite-nephelite basalt of Moiliili, Oahu, Hawaiian Islands which has been described by Cross.[5] In places in this rock the interstitial material consists entirely of anhedra of nephelite but in other places it is a mixture of nephelite and analcite in which the nephelite occurs as euhedra in an analcite base and in which there can, therefore, be no question of the analcite being formed by alteration of the nephelite. The attack of the alkaline liquid on the augite is shown by the outlines of the augite "interlocking most irregularly

[4] Neues Jahrb., Centralbl. 1922: 495–545.

[5] W. Cross. U. S. Geol. Surv. Prof. Paper 88: 20–22. 1915.

with other minerals."[6] It is believed that the melilite was formed as a result of this attack though, admittedly, it does not occur in typical reaction-rim form.

The other melilite rock showing analcite is a melilite-nephelite basalt from pipe No. 3 E 5°S of Wolf Kraal House, Namaqualand.[7] It shows nephelite and analcite in the same relation as that described above, but the whole rock is much finer-grained than the Hawaiian example and the general relations of the minerals more obscure.

It is apparent, then, that analcite does occur as a residual mineral in some melilite rocks. In deep-seated rocks the reaction between nephelite and pyroxene to produce analcite and melilite is reversed. It is probable that some melilite is produced by the addition of lime to ordinary basalts, but when so formed one would expect it to be found in deep-seated rocks as commonly as in effusive and dike rocks. The fact that melilite is practically absent from deep-seated rocks suggests the dominance of the other method of production, namely, interaction of nephelite and pyroxene which requires the rapid cooling accompanying eruption in order to prevent its reversal at lower temperatures.

ROCK NAMES

It has been noted on a former page that polzenite and its characters escaped notice on account of its unfamiliar name, nevertheless it should be stated that polzenite is as much entitled to a new and distinctive name as many other rock types. It does seem, however, that the time has come to call a halt to the wholesale manufacture of rock names. Frequently these names designate only a slight departure in texture or in relative proportions of minerals from some common types with familiar names, and these variants could more profitably be described under the familiar names with appropriate modifying words or phrases. Such a procedure would undoubtedly result in many cumbersome names, but better a cumbersome name that immediately conveys the character of the rock to the reader than a concise name that conveys nothing but the locality where the rock happened to be first found.

Lest it be supposed that the objections raised are directed principally against the polzenite of Scheumann, I wish to cite an instance nearer home. I have just read in manuscript a paper on Hawaiian lavas by my colleague Doctor Washington, in which paper the names kohalaite, mugearite, and hawaiite are used to designate certain

[6] Cross. op. cit.: p. 21.

[7] Locality so described by A. W. Rogers on submitting specimen to H. S. Washington for analysis.

types. Following kohalaite is found, in brackets, oligoclase andesite, and following mugearite, olivine-oligoclase andesite. Would not these more familiar terms by themselves have been more desirable? One finds, too, that hawaiite is just an andesine basalt. Why not call it that and not perpetuate names that add to our already heavy burden?[8]

A comparatively few type names with appropriate qualifying words should be sufficient to designate all rocks. Occasionally names that are inconveniently cumbersome will result, but sodium para-dimeth-amino-azobenzene-para-sulphonate is an unwieldy name yet it thoroughly justifies itself by telling the chemist the nature and properties of the substance named.

We do not labor under the same difficulties as do the workers in biologic science, for it would be an impossible task to formulate a name for an oak tree that would give a clear picture of how it differs from a maple tree. But two rock types that have received wholly unrelated names may differ from each other merely in the presence or absence of a definite, concrete, crystalline phase, which fact could readily be expressed in the names applied to them.

The choice of names for rocks has an importance apart from that connected with convenience for use by petrologists themselves. It can scarcely be doubted that future advances in our knowledge of rocks must come in large part through the application of physics and chemistry to the problems which rocks present. This means the co-operation of the physicist and chemist with the petrologist, and this in turn necessitates a certain amount of respect for the petrologist and his science. But how can the physicist and chemist respect a man who continues to base the names of new rock types on nothing more fundamental than the name of the locality in which they are found?

Only the confirmed systematist can hope to keep abreast of the ever increasing multitude of rock names. In the meantime the one whose prime interest lies in other aspects of rocks, but who must keep informed of the newly discovered facts of petrology, has an unnecessary and almost insupportable burden placed upon him in the never-ebbing tide of pienaarite, tveitasite, modlibovite, damkjernite, ankaratrite, assyntite, muniongite, orendite, sviatoynossite, yamaskite, kauaiite, ghizite, and leeuwfonteinite.

De profundis clamavi.

[8] Since this was written Dr. Washington has made changes in his paper so that the above remarks apply only to his original manuscript. He has dropped the locality names and joined forces with me in criticism of them.

BOTANY.—*New species of plants from western Mexico.* PAUL C. STANDLEY, U. S. National Museum.[1]

Among the numerous collections of Mexican plants in the U. S. National Herbarium there are probably none of greater value and few equal in importance to those obtained by Prof. C. Conzatti during his many years of residence in the State of Oaxaca. At frequent intervals he has generously presented to the National Museum sets of specimens of his collections, mostly secured in Oaxaca, until now these amount to over four thousand sheets, which possess an added value because of the care with which they have been prepared. Almost every sending from Professor Conzatti includes at least a few undescribed plants, and always there are representatives of many rare and imperfectly known species. The list of distinct new plants discovered in Professor Conzatti's collections is already a long one, and there doubtless remain many more in the herbarium under groups which have not been studied critically.

Five of the species here proposed as new were contained in a small shipment of plants received last summer. This sending also included an exceptionally large number of rare species, many of which were known previously from a single collection. Several others of the plants probably represent new species, but they belong to groups in which it does not appear desirable to describe further novelties until critical revision can be undertaken. There is published here also a description of a new species of *Caesalpinia* from Sinaloa, and a tree previously described as a *Pithecollobium* is transferred to a more natural position in the genus *Albizzia*.

Allionia grandiflora Standl., sp. nov.

Stems slender, branched, densely short-pilose throughout, the pubescence viscid above; petioles slender, 5–12 mm. long, short-pilose, the blades ovate to broadly ovate, 3–5 cm. long, 2–3 cm. wide, acuminate, rounded or obtuse at base, thin, densely short-villous on both surfaces; involucres mostly in terminal one-sided cymes, short-pedunculate, 1-flowered, about 1 cm. long, densely villous, the lobes lanceolate, acuminate; perianth magenta, 2.5–3 cm. long, densely pilose below, glabrate above, the tube 1.5–2 cm. long and 3 mm. thick; stamens included; fruit (immature) 7 mm. long, constricted near the base, minutely puberulent, the 5 ribs broad and nearly smooth.

Type in the U. S. National Herbarium, no. 1,110,839, collected on the Cerro Jucusá, Tututepec, Oaxaca, Mexico, altitude 240 meters, Dec. 13, 1921, by C. Conzatti (no. 4449).

In general appearance this plant resembles a *Mirabilis*, but it possesses

[1] Published by permission of the Secretary of the Smithsonian Institution. Received December 1, 1922.

the technical characters of the genus *Allionia*. It is not closely related to any previously known species, its most distinctive character being the large perianth.

Albizzia tomentosa (Micheli) Standl.

Pithecollobium tomentosum Micheli, Mém. Soc. Phys. Hist. Nat. Genève **34**: 285. *pl. 28*. 1903.

In a recently published part of a volume upon the woody plants of Mexico,[2] some doubt was expressed by the writer as to the proper generic position of the tree described by Micheli as *Pithecollobium tomentosum*. When the manuscript for the treatment of the genus was prepared, fruiting material of this species was not available. Specimens with both fruit and flowers, collected recently in the State of Sinaloa, Mexico, by Mr. Jesús G. Ortega (no. 4554), indicate that the proper place of the tree is in the genus *Albizzia*. The fruit is flat, about 11 cm. long and 2 cm. wide, and has thin, elastically dehiscent valves. The vernacular name used in Sinaloa is "palo joso."

Caesalpinia ortegae Standl., sp. nov.

Branchlets densely covered with stipitate black glands; leaves long-petiolate, the petioles and rachis covered with stipitate glands; pinnae usually 3 pairs, the leaflets 7 or 8 pairs, oblong, 6–11 mm. long, 2.5–4 mm. wide, rounded at apex, thinly pilose with short slender stiff whitish subappressed hairs, beneath copiously furnished with sessile black glands; racemes elongate, densely covered on the rachis, pedicels, and calyx with black stipitate glands and also pilosulous with short spreading white hairs, the pedicels 5–10 mm. long, articulate below the middle; sepals entire; petals about 1 cm. long; fruit elastically dehiscent, flat, densely covered with short-stipitate black glands, falcate, about 6 cm. long and 1.2 cm. wide; seeds strongly compressed, rounded-obovate, 7–8 mm. long.

Type in the U. S. National Herbarium, no. 1,083,885, collected in the State of Sinaloa, Mexico, by Jesús G. Ortega (no. 890).

Well distinguished from the related Mexican species by the extraordinary abundance of stipitate glands on all parts of the plant. It is a pleasure to be able to name so well-marked a species in honor of its collector, who during the past few years has made many valuable contributions to the knowledge of the Sinaloan flora.

Amyris conzattii Standl., sp. nov.

Branchlets slender, grayish, glabrate; leaves alternate, the rachis slender, 4–7 cm. long, thinly puberulent, the leaflets about 21, rhombic or ovaterhombic, 6–12 mm. long, 3–8 mm. wide, obtuse or rounded at apex, very oblique at base, entire or obscurely crenulate, glabrous or sometimes sparsely puberulent above, with very numerous large glands; flowers in lax terminal glabrous panicles, the fruiting pedicels 5–10 mm. long; drupes globose, 8–10 mm. in diameter, the pericarp filled with large and conspicuous oil glands.

Type in the U. S. National Herbarium, no. 1,110,840, collected at Los Sabinos, between Juchatengo and Santa Ana, Oaxaca, Mexico, altitude 1,000 meters, Dec. 29, 1921, by C. Conzatti (no. 4556).

[2] Contr. U. S. Nat. Herb. **23**: 397. 1922.

In the key to the species of *Amyris* by Percy Wilson in the North American Flora (25: 216. 1911), this plant runs at once to *A. texana* (Buckl.) P. Wils., a species occurring in Texas and northeastern Mexico, but with trifoliolate leaves. *Amyris conzattii* is not closely related to any of the species previously known from North America.

Schaefferia oaxacana Standl., sp. nov.

Branches greenish, striate-angulate, glabrous; leaves mostly fasciculate, oblong-spatulate or oblong-obovate, 1–2 cm. long, 4–8 mm. wide, rounded or emarginate at apex, cuneately narrowed at base to a very short petiole, glabrous, pinnately nerved, the costa prominent, the lateral nerves ascending at a very acute angle, inconspicuous; flowers solitary or fasciculate at the nodes, on stout pedicels 1.5–2.5 mm. long; fruit oval, 2-celled, about 8 mm. long.

Type in the U. S. National Herbarium, no. 1,110,837, collected near the Cumbre de las Calaveras, Distrito de Zimatlán, Oaxaca, Mexico, altitude 2,200 meters, Nov. 27, 1921, by Conzatti (no. 4325).

The only related species is *S. cuneifolia* Gray, a native of Coahuila and Texas. In that the branchlets are short, stiff, divaricate, and often spinose, while in *S. oaxacana* they are long, slender, ascending, and not spinose, differences which give quite different aspects to the two species. In the Texan plant, moreover, the fruits are much smaller and sessile.

Bouvardia oaxacana Standl., sp. nov.

Branchlets slender, terete, glabrous or minutely puberulent about the nodes; stipule sheath 2–3 mm. long, puberulent, the lobes obtuse, cuspidate; leaves opposite, the petioles puberulent, equaling or shorter than the stipules, the blades ovate or broadly ovate, 4–6 cm. long, 2–4 cm. wide, acuminate, broadly rounded at base, thin, sparsely puberulent or glabrate, conspicuously 5-nerved, the lateral nerves arcuate and extending nearly or quite to the apex; inflorescence terminal, cymose-corymbose, dense, many-flowered, the pedicels 2–4 mm. long, hirtellous; hypanthium hirtellous; calyx lobes linear-lanceolate, 5–9 mm. long, puberulent; corolla red, glabrous outside, the tube about 17 mm. long, the lobes oblong, 5 mm. long, obtuse, glabrous; anthers about equaling the corolla lobes; style not exserted.

Type in the U. S. National Herbarium, no. 1,110,842, collected between Santa Cruz and El Aguacate, Distrito de Juquila, Oaxaca, Mexico, altitude 500 meters, Dec. 24, 1921, by C. Conzatti (no. 4513).

Related to *B. quinquenervata* Standl., of Chiapas, which is distinguished by its small corolla and shorter, narrower calyx lobes. In one of the specimens of *B. oaxacana* the corolla is sparsely puberulent, but this probably represents an unimportant variation from the typical form with glabrous corolla.

Chomelia barbata Standl., sp. nov.

Plants unarmed, the branchlets slender, appressed-pilose; stipules 3 mm. long, deltoid, cuspidate, appressed-pilose outside; petioles slender, 5–8 mm. long, puberulent; leaf blades elliptic or rounded-elliptic, 3.5–5.5 cm. long, 2–3.5 cm. wide, obtuse or acutish, rounded to acute at base, glabrous above except along the costa, beneath densely barbate along the costa, elsewhere

puberulent or glabrate, the lateral nerves inconspicuous; cymes lateral, dense, few-flowered, the peduncles very slender, 2.5–3.5 cm. long, pilosulous with whitish subappressed hairs; flowers sessile or subsessile, ebracteolate, obscurely or not at all secund; hypanthium and calyx cylindric, 2–2.5 mm. long, appressed-pilosulous, the lobes minute, obtuse; corolla densely appressed-pilosulous outside, the slender tube 15 mm. long, the lobes oblong-ovate, obtuse, 2.5 mm. long; anthers semiexserted; fruit white, 2-celled, oblong, glabrate, 1–1.5 cm. long.

Type in the U. S. National Herbarium, no. 1,110,841, collected in the vicinity of Chacahua, Distrito de Juquila, Oaxaca, Mexico, altitude 5 meters, Dec. 17, 1921, by C. Conzatti (no. 4475).

Related to *C. microloba* Donn. Smith, of Costa Rica, which differs in its small flowers and scant pubescence.

ZOOLOGY.—*A revision of the recent representatives of the crinoid family Pentacrinidæ, with the diagnoses of two new genera.*[1] AUSTIN H. CLARK, National Museum.

A detailed study of the recent representatives of the crinoid family Pentacrinidæ shows that these are by no means so closely allied to the fossil species in the same family as has been supposed. None of them can be considered as congeneric with *Isocrinus pendulus* with which most of them have been associated, and their relationships with other fossil types are still more remote.

The following disposition of the living forms is suggested.

KEY TO THE RECENT GENERA OF PENTACRINIDÆ

a^1 Second post-radial ossicle not an axillary
  b^1 fourth post-radial ossicle an axillary
    Saracrinus
  b^2 first axillary beyond the fourth post-radial ossicle
    Metacrinus
a^2 Second post-radial ossicle an axillary from which two arm trunks arise
  b^1 elements of the IBr series (the first two post-radial ossicles) united by syzygy
    c^1 at least the outer division series of more than 6 elements; proximal pinnules with a strongly serrate profile
      Cenocrinus
    c^2 none of the division series of more than 4 elements; proximal pinnules with a smooth profile
      d^1 division series beyond the first entirely, or at least mostly, of more than 2 elements
        e^1 division series beyond the first variable, but never 3(1+2); distal edges of the post-radial ossicles everted and produced
          Teliocrinus
        e^2 all the division series beyond the first 3(1+2); distal edges of the post-radial ossicles not produced
          Endoxocrinus

[1] Received December 6, 1922.

d^2 all of the division series 2(1+2)

e^1 cirri long and stout, composed of more than 20 (usually more than 30) segments, the whorls of cirri being separated by 1–10 pentagonal to bluntly stellate internodals

Diplocrinus

e^2 cirri short, consisting of about 18 segments, the whorls separated by 30–40 or more rounded internodals

Annacrinus

b^2 elements of the IBr series not united by syzygy

c^1 more than 10 arms

Neocrinus

c^2 ten arms only

Hypalocrinus

Genus Metacrinus P. H. Carpenter

Metacrinus P. H. CARPENTER, Bull. Mus. Comp. Zoöl., vol. 10, No. 4, 1882, p. 167 (no species included).—P. H. CARPENTER, "Challenger" Reports, Zoölogy, vol. 11, part 32, 1884, p. 344.

Diagnosis.—A genus of Pentacrinidæ in which the first axillary is beyond the fourth, and is usually the seventh, post-radial ossicle.

Genotype.—*Metacrinus wyvillii* P. H. Carpenter, 1884 (cf. A. H. Clark, Proc. U. S. Nat. Mus., vol. 34, 1908, p. 527).

Geographical range.—From southern Japan to the Kermadec Islands and southeastern Australia, and westward to the Kei Islands.

Bathymetrical range.—From 119 to 1133 meters.

Included forms.—*Metacrinus costatus* P. H. Carpenter, *M. cyaneus* H. L. Clark, *M. interruptus* P. H. Carpenter, *M. moseleyi* P. H. Carpenter, *M. nodosus* P. H. Carpenter, *M. rotundus* P. H. Carpenter, *M. stewarti* P. H. Carpenter, *M. wyvillii* P. H. Carpenter, and *M. zonatus* A. H. Clark.

Saracrinus, gen. nov.

Diagnosis.—A genus of Pentacrinidæ in which the fourth post-radial ossicle is the first axillary.

Genotype.—*Metacrinus nobilis* P. H. Carpenter, 1884.

Geographical range.—From the Korean Straits and the Bonin Islands to the Kermadec Islands and southeastern Australia,[2] and westward to Sumatra.

Bathymetrical range.—From 55 to 1133 meters.

Included forms.—*Saracrinus acutus* (Döderlein), *S. angulatus* (P. H. Carpenter), *S. batheri* (A. H. Clark), *S. batheri* var. *gracilis* (A. H. Clark), *S. cingulatus* (P. H. Carpenter), *S. nobilis* (P. H. Carpenter), *S. nobilis* var. *borealis* (A. H. Clark), *S. nobilis* var. *murrayi* (P. H. Carpenter), *S. nobilis* var. *nobilis* (P. H. Carpenter) (= var. *typica* [Döderlein]), *S. nobilis* var.

[2] It is evident from Dr. H. L. Clark's description of *Metacrinus cyaneus* (Biol. Results Fishing Experiments F. I. S. "Endeavour," vol. 4, part 1, 1916, p. 9) that some of his specimens belonged to a species of this genus; the figure, however, represents a true *Metacrinus*.

sumatranus (Döderlein), *S. nobilis* var. *tenuis* (Gislén), *S. nobilis* var. *timorensis* (Döderlein), *S. nobilis* var. *tuberculatus* (A. H. Clark), *S. serratus* (Döderlein), *S. superbus* (P. H. Carpenter), *S. suluensis* (Döderlein), *S. tuberosus* (P. H. Carpenter), and *S. varians* (P. H. Carpenter).

Genus Cenocrinus Wyville Thomson

Cenocrinus WYVILLE THOMSON, The Intellectual Observer, vol. 6, No. 31, August 1864, p. 2.

Diagnosis.—A genus of Pentacrinidæ in which the first two post-radial ossicles are united by syzygy and the second is axillary, the following division series consist of numerous segments, more than 6 in the outermost, and the segments of the proximal pinnules have strongly projecting distal angles so that these pinnules have a strongly serrate outline.

Genotype.—*Pentacrinites caput-medusæ* Miller, 1821 (= *Encrinus caput-medusæ* Lamarck, 1816 = *Isis asteria* Linné, 1766).

Geographical range.—West Indies; Cuba to Barbados.

Bathymetrical range.—From shallow water (it has been found on the beach at Barbados) to 585 meters.

Included species.—*Cenocrinus asteria* (Linné).

Remarks.—Although this species, which is so frequently figured in text-books, was first described by Guettard so long ago as 1761, and by Ellis in 1762, only sixteen specimens of it have so far come to light; but three undetermined specimens mentioned by early writers may also belong to it.

Genus Teliocrinus Döderlein

Teliocrinus DÖDERLEIN, Wiss. Ergebn. d. deutsch. Tiefsee Exped., vol. 17, Heft 1, 1912, p. 22.

Comastrocrinus A. H. CLARK, Crinoids of the Indian Ocean, 1912, p. 252.

Diagnosis.—A genus of Pentacrinidæ in which the first two post-radial ossicles are united by syzygy and the second is axillary, the division series beyond the first are variable, but never of 3(1+2), rarely of two, and never of more than six elements, and the ossicles of the division series and brachials have everted and strongly produced distal borders.

Genotype.—*Teliocrinus asper* Döderlein, 1912 (= *Hypalocrinus springeri* A. H. Clark, 1909).

Geographical range.—From western Sumatra northward to the Gulf of Martaban and westward to the Laccadive Islands and the western coast of India.

Bathymetrical range.—From 366 to 1280 meters.

Included forms.—*Teliocrinus liliaceus* (A. H. Clark), *T. ornatus* (A. H. Clark), and *T. springeri* (A. H. Clark) (= *T. asper* Döderlein).

Genus Endoxocrinus A. H. Clark

Endoxocrinus A. H. CLARK, Proc. Biol. Soc. Washington, vol. 21, 1908, p. 151.—A. H. CLARK, Proc. U. S. Nat. Mus., vol. 35, 1908, p. 131.

Diagnosis.—A genus of Pentacrinidæ in which the first two post-radial ossicles are united by syzygy and the second is axillary, all the following division series are 3(1+2), and the first two brachials are united by syzygy.

Genotype.—*Encrinus parræ* Gervais, 1835 (= *Encrinus milleri* Guilding, 1828 [not *Encrinites milleri* von Schlotheim, 1822] = *Pentacrinus mülleri* Oersted, 1856).

Geographical range.—West Indies; Cuba to St. Vincent.

Bathymetrical range.—From shallow water (whence it is occasionally brought up by fishermen) down to 526 meters.

Included species.—*Endoxocrinus parræ* (Gervais).

Remarks.—In the "Challenger" report Carpenter confused this species with *Diplocrinus maclearanus* and his account of *"Pentacrinus mülleri"* is based upon specimens of both species. This explains the discrepancy between the original diagnosis of *Endoxocrinus* and the characters of the type species, and also Döderlein's confusion regarding *parræ* at the time he proposed the genus *Diplocrinus*.

Genus Diplocrinus Döderlein

Diplocrinus DÖDERLEIN, Wiss. Ergebn. d. deutsch. Tiefsee Exped., vol. 17, Heft 1, 1912, p. 21.

Diagnosis.—A genus of Pentacrinidæ in which all of the division series are 2(1+2), the first two brachials are united by syzygy, and the cirri are long and stout with more than 20 (usually more than 30) segments, the whorls being separated by 1–10 pentagonal to stellate internodals.

Genotype.—Here designated as *Pentacrinus maclearanus* Wyville Thomson, 1877.

Geographical range.—From Florida to Brazil, and from Timor to the Philippine and Meangis Islands.

Bathymetrical range.—From 154 to 1097 meters.

Included forms.—*Diplocrinus alternicirrus* (P. H. Carpenter), *D. maclearanus* (Wyville Thomson), and *D. sibogæ* (Döderlein).

Annacrinus, gen. nov.

Diagnosis.—A genus of Pentacrinidæ in which all of the division series are 2(1+2), the first two brachials are united by syzygy, and the cirri are short with about 18 segments the whorls being separated by 30–40 or more rounded internodals.

Genotype.—*Pentacrinus wyville-thomsoni* (Jeffreys, *nomen nudum*) Wyville Thomson, 1872.

Geographical range.—From the Bay of Biscay to Morocco and the Canary Islands.

Bathymetrical range.—From 1330 to 2002 meters.

Included species.—*Annacrinus wyville-thomsoni* (Wyville Thomson).

Genus Neocrinus Wyville Thomson

Neocrinus WYVILLE THOMSON, The Intellectual Observer, vol. 6, No. 31, August 1864, p. 7.

Diagnosis.—A genus of Pentacrinidæ in which the first two post-radial ossicles are united by synarthry and the second is axillary; IIBr and often further division series are present.

Genotype.—*Pentacrinus decorus* Wyville Thomson, 1864.

Geographical range.—West Indies; from Florida to Grenada.

Bathymetrical range.—From shallow water (sometimes brought up on Fishermen's lines) down to 1219 meters.

Included forms.—*Neocrinus blakei* (P. H. Carpenter), and *N. decorus* (Wyville Thomson).

Genus Hypalocrinus A. H. Clark

Hypalocrinus A. H. CLARK, Proc. Biol. Soc. Washington, vol. 21, 1908, p. 152.—A. H. CLARK, Proc. U. S. Nat. Mus., vol. 35, 1908, p. 130.

Diagnosis.—A genus of Pentacrinidæ in which the first two post-radial ossicles are united by syzygy and the second is axillary; there is no further arm division.

Genotype.—*Pentacrinus naresianus* P. H. Carpenter, 1882.

Geographical range.—From the Kermadec Islands and Fiji to the Philippines and Celebes.

Bathymetrical range.—From 621 to 2468 meters.

Included species.—*Hypalocrinus naresianus* (P. H. Carpenter).

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

WASHINGTON ACADEMY OF SCIENCES

166TH MEETING

The 166th meeting of the ACADEMY was held jointly with the Chemical Society of Washington (Local Section of the American Chemical Society) in the Assembly Hall of the Cosmos Club, the evening of Thursday, March 16, 1922. Dr. R. B. MOORE, Chief Chemist, Bureau of Mines, delivered an illustrated lecture, entitled, *The rare gases: Their history, properties, and uses.*

The lecturer gave first an outline of the history of the discovery of the rare gases. The first one, argon, was discovered jointly by Ramsay and Raleigh, due to an investigation by them of the difference in the density of nitrogen obtained from the air and from other sources. The discovery of helium was based on the observation of Dr. W. F. Hillebrand in 1888 that certain uranium minerals on heating or on solution in acid gave off gases, a considerable proportion of which appeared to be nitrogen. Ramsay showed that the residual gas, instead of being pure nitrogen, contained helium. Neon, krypton, and xenon were discovered by Ramsay and Travers through the fractionation of liquid air.

The physical properties of the elements were described, and their occurrence in nature fully gone into. Of special interest is the occurrence of helium not only in certain minerals and in the gases from springs, but also in natural gases from certain localities in the United States. The gases from some of the springs in France are particularly rich in helium, going as high as 10 per cent by volume. On the other hand, whereas the per cent in natural gas is not nearly so large (the maximum amount being about 1.8 per cent helium), the total volume of helium available is immense in proportion to that obtained from springs.

The origin of the rare gases was discussed, particularly the probable origin of helium: The latter may either come from radioactive changes or, assuming the Nebular hypothesis, from the atmosphere of the sun or the disintegration of supposedly non-radioactive elements, the alpha particle having a velocity below what is required for the ionization of gases.

The commercial production of helium, argon, and neon was described, and the Government project for the production of helium from natural gas for use in dirigibles and balloons was gone into in some detail. The early work in connection with the three experimental plants during the war and the development of the project since that time were fully described.

167TH MEETING

The 167th meeting of the ACADEMY was held jointly with the Philosophical Society of Washington and the Chemical Society of Washington in the Assembly Hall of the National Museum, the evening of Wednesday, March 29, 1922. Dr. F. W. ASTON, of Cambridge University, England, delivered an illustrated address on *Isotopes and the structure of the atom.*

The experimental study of radioactive elements led to the new and revolutionary conclusion that elements might exist which were chemically identical but which differed in radioactive properties and even in atomic weight. This idea has been strongly supported by the results of positive ray analysis,

which show that many of the non-radioactive elements may exist in two or more forms having practically identical chemical and spectroscopic properties but with different atomic weights. Such substances are called isotopes, because they occupy the same place in the periodic table of the elements.

The speaker described his mass spectrograph, which he has employed with great effectiveness in the detection of isotopes. The positively charged ions of the element under examination are projected first through an electric field and then through a magnetic field, impinging finally upon a photographic plate. If the element under examination consists of two isotopes, two lines or bands appear in the spectrum, the position of the line being determined by the mass of the isotope. Thus, boron (atomic weight 10.9) has two isotopes with masses 10 and 11; magnesium (atomic weight 24.32) has three isotopes with masses 24, 25, and 26. Fifteen or more of the non-radioactive elements have thus been shown to be isotopic mixtures, while others give no evidence of such complexity.

An excellent account of Dr. ASTON's brilliant work in this field, for which he has recently been awarded the Nobel prize, may be found in his book on Isotopes.

168TH MEETING

The 168th meeting of the ACADEMY was held jointly with the American Institute of Electrical Engineers (Washington Section) in the Assembly Hall of the Cosmos Club, the evening of Thursday, May 18, 1922. Dr. A. VAN DYCK, of the General Electric Company, delivered an address on *The vacuum tube in present day radio.*

Doctor Van Dyck first outlined the fundamental relations between current and voltage within the electron tube or "triode," and showed how the presence of a minute charge of electricity on the grid could control the flow of much larger currents to the plate. Such tubes are useful as rectifiers, detectors, amplifiers, and modulators. He then showed a large number of slides illustrating the astonishing development of the electron tube during the past few years, and the huge scale on which it is now being applied in radio-telegraphy and -telephony, as well as to the extension of the range of wire telephony. Many of the slides illustrated the elaborate equipment installed in the high-power radio-telephone broadcasting stations.

169TH MEETING

The 169th meeting of the ACADEMY was held jointly with the Medical Society of the District of Columbia and the Society of American Bacteriologists Washington Branch) in the Auditorium of the Medical Society, the evening of Tuesday, September 19, 1922. Dr. K. F. MEYER, Acting Director of the Hooper Foundation, delivered a lecture, entitled, *A summary of the studies on B. botulinus conducted at the Hooper Foundation for Medical Research, University of California.*

The address was illustrated with lantern slides, and included a description of the methods employed and a statement of the results obtained in an intensive study of this subject lasting more than two years Among the subjects discussed were: Distribution of *B. botulinus* in nature; the conditions under which it will grow; the biochemical activities of *B. botulinus;* the relation of toxin formation to the growth curve of the micro-organism and to physical evidence of spoilage of the food; heat resistance of *B. botu-*

linus; epidemiology of botulism. The detailed results of the investigation are given in a series of articles that are appearing in the Journal of Infectious Diseases.

170TH MEETING

The 170th meeting of the ACADEMY was held jointly with the Biological Society of Washington and the Chemical Society of Washington in the Assembly Hall of the Cosmos Club, the evening of Thursday, October 19, 1922. Dr. H. J. HAMBURGER, Professor of Physiology, University of Groningen, Holland, delivered an address, entitled, *The increasing significance of chemistry in medical thought and practice.*

Doctor HAMBURGER reviewed briefly the contributions of the older schools of thought to the chemical aspects of medicine, dwelling particularly upon the experiments of Paracelsus. In these early contributions there can be seen the first faltering steps in the construction of a mechanistic physiology. With the advent of modern chemical experimentation many of the bodily processes which had been regarded as under "vitalistic" control were shown to be under the control of such clearly defined forces as those of osmosis, electrolytic dissociation, and specific chemical reactions.

The complexity of the problem faced by the chemist is illustrated by the proteins. The chemist has isolated and identified the amino-acids of which the proteins are composed and he has shown how these, like bricks, may be put together to form an infinite variety in protein architecture. He has actually synthesized proteins of immense molecular weight, and although he can not fomulate the detailed structures of the infinite variety of proteins found in nature he can account for the variety demonstrated by the delicate reactions of immunology.

Of late it has been shown that the body forms substances which, circulating in the blood, act as messengers to control various processes. Two of these have been identified chemically and many more are known by their physiological action. The presence or absence of one or another of these so-called hormones may determine a specific set of characteristics. For instance, it has been experimentally demonstrated that the sex of a young animal may be altered by the removal of the ovaries and the implantation of testes.

As each contribution of chemistry is applied in medicine the case for the mechanistic physiology becomes stronger.

WILLIAM R. MAXON, *Recording Secretary.*

SCIENTIFIC NOTES AND NEWS

The President has withdrawn from settlement three groups of prehistoric towers in southwestern Colorado and southeastern Utah. These are known as the ruins in Ruin Canyon, Holly Canyon, and Cool Spring House on Cajon Mesa. It is proposed that these groups be made a National Monument.

On the occasion of the meeting of the Trustees of the Carnegie Institution of Washington on December 14 a reception and exhibition of apparatus and methods were held at the Administration Building of the Institution.

The Pick and Hammer Club met at the U. S. Geological Survey on Saturday, December 2. Dr. F. E. WRIGHT spoke on geology in South Africa.

At the meeting of the Physics Club of the Bureau of Standards on December 11, Dr. J. C. KARCHER reported briefly on the papers on acoustics presented at the Chicago meeting of the American Physical Society, December 1–2, 1922.

The following public lectures have been given under the auspices of the Carnegie Institution of Washington: November 28. THOMAS HUNT MORGAN, professor of experimental zoology, Columbia University: *The constitution of the hereditary material and its relation to development.* December 5. HENRY NORRIS RUSSELL, director of the Princeton University Observatory: *The properties of matter as illustrated in the stars.* December 12. WALTER S. ADAMS, acting director of the Mount Wilson Observatory: *The motions of the stars.*

Dr. PENTTI ESKOLA, who has been engaged in research work at the Geophysical Laboratory, Carnegie Institution of Washington, for the past eighteen months, has returned to Finland to resume his work for the Geological Survey of that country.

Dr. CHARLES W. GILMORE has returned to his duties in the Department of Paleontology, U. S. National Museum, after a two months' absence at the University of Alberta, Edmonton, Canada.

Dr. JOHN B. HUNTER, professor of anatomy at the University of Sidney, Australia, visited Washington in December.

Dr. A. SOMMERFELD of the University of Munich, Germany, will deliver a course of lectures on general quantum theory at the Bureau of Standards early in March.

Dr. P. V. WELLS of the Optics Division of the Bureau of Standards resigned on December 1 to take up research work for the E. I. du Pont de Nemours Company, Parlin, New Jersey.